WATER RESOURCES REVIEW for

JULY

1972

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

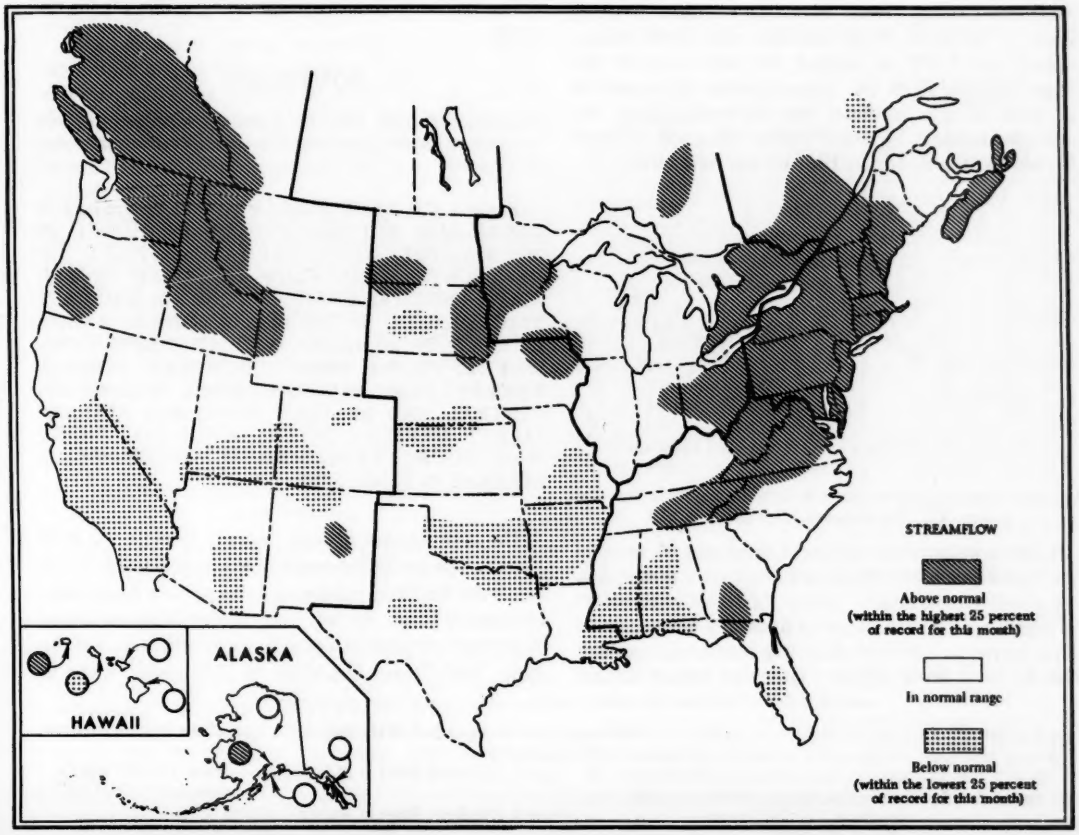
CANADA
DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS BRANCH

STREAMFLOW AND GROUND—WATER CONDITIONS

Streamflow decreased seasonally in southern Canada and in most of the United States. Principal exceptions were increased flows in Mississippi, Tennessee, and Kentucky in the Southeast; Arizona and New Mexico in the West; and in Hawaii.

Severe flooding occurred on streams in east-central Minnesota, the Iowa City, Iowa, area, and Gallup, New Mexico.

Areas of markedly below-normal streamflow were limited to the southern half of the United States. However, the only reports of municipal water-supply shortages were of some cities in the San Francisco Bay area of central California. Elsewhere, streamflow was far below normal for July in northwestern Kansas, southern Oklahoma, and central and southwestern Utah. Contrasting with these low flows were the relatively high flows in the Northeast, in part the result of carryover of remnants of the record-breaking flood flows of June, such as in Pennsylvania, New York, and Connecticut.



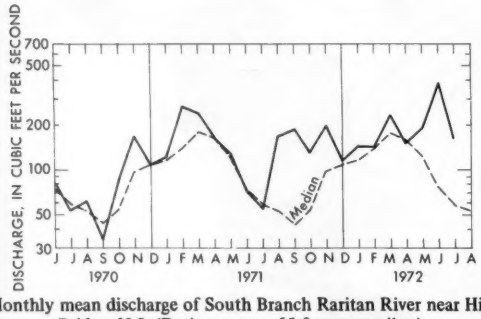
CONTENTS OF THIS ISSUE: Northeast, Southeast, Western Great Lakes region, Midcontinent, West; Alaska; Usable contents of selected reservoirs near end of July 1972; Flow of major rivers during July 1972; Estimated use of water in the United States in 1970.

NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

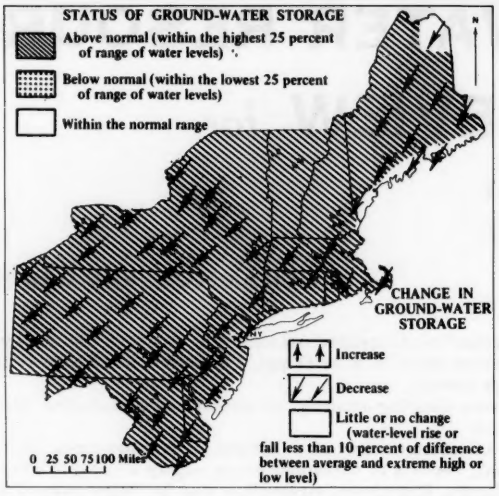
STREAMFLOW DECREASED BUT REMAINED IN THE ABOVE-NORMAL RANGE IN MOST OF THE REGION.

High carryover flows from June coupled with runoff from near- or above-normal precipitation during July produced discharges that were high compared with normal summer flows. In Connecticut, for example, streamflow was second highest for July in more than 40 years of record. In western Massachusetts, monthly mean discharge of West Branch Westfield River at Huntington, 20 miles northwest of Springfield, was highest for the month in the 37 years of record. In central and northern Vermont and New Hampshire, above-normal runoff was caused by several storms, notably about July 4, 11, and 22–24. At the index stream-gaging station, White River at West Hartford, Vermont (drainage area, 690 square miles), daily mean discharge on the 24th was 5,170 cfs, highest for a day in July in the 57 years of record. In southeastern Quebec province, monthly mean discharge of Saint Francois River at Hemming Falls (drainage area, 3,660 square miles), was 7,630 cfs, highest for July in record that began October 1926. The general pattern of streamflow in most of the Northeast was decreasing flows, but averaging considerably above median (see graph of South Branch Raritan River near High Bridge, New Jersey).



Monthly mean discharge of South Branch Raritan River near High Bridge, N.J. (Drainage area, 65.3 square miles.)

Ground-water levels decreased seasonally in most of the region (see map). Monthend levels were nearly all in the above-normal range––partly the result of carryover of high levels from recharge by unusually heavy rains of June. In parts of New York, Pennsylvania, and southern New England, levels in many wells were highest for end of July in more than 25 years of record. However, levels on Long Island, New York, remained within the normal range.


STATUS OF GROUND-WATER STORAGE
Above normal (within the highest 25 percent of range of water levels)
Below normal (within the lowest 25 percent of range of water levels)
Within the normal range
CHANGE IN GROUND-WATER STORAGE
Increase
Decrease
Little or no change (water-level rise or fall less than 10 percent of difference between average and extreme high or low level)
0 25 50 75 100 Miles

Map above shows ground-water storage near end of July and change in ground-water storage from end of June to end of July.

SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

FLOWS OF MOST STREAMS IN SEVEN STATES DECREASED, BUT STREAMFLOW INCREASED IN MISSISSIPPI, TENNESSEE, AND PART OF KENTUCKY. STREAMFLOW REMAINED IN THE ABOVE–NORMAL RANGE IN VIRGINIA AND WEST VIRGINIA, AND IN THE BELOW-NORMAL RANGE IN MUCH OF ALABAMA AND MISSISSIPPI. ELSEWHERE, FLOWS WERE GENERALLY NORMAL EXCEPT FOR ABOVE-NORMAL FLOWS IN CENTRAL AND EASTERN TENNESSEE AND ADJACENT WESTERN NORTH CAROLINA. THERE WAS LOCAL FLOODING ON SOME SMALL STREAMS IN TENNESSEE.

The continuation of high flows in Virginia and West Virginia was partly the result of substantial residual runoff from the flood-producing rains of late June. Also, however, a storm on July 5–6 in West Virginia caused major rises on some streams. In the southern part of the State, daily mean discharge of Greenbrier River at

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CORRECTIONS: Editorial errors in Pennsylvania stream-discharge data on pages 2–4 of the June 1972 issue of the *Water Resources Review* have been brought to our attention. Corrections are as follows:

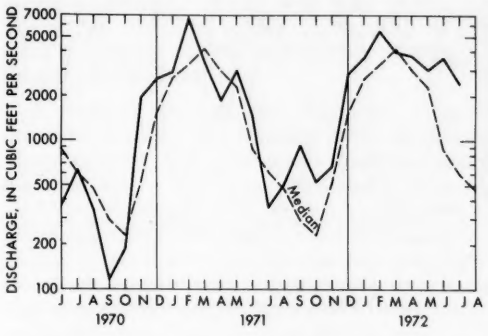
Page 2, line 30––delete reference to Schuylkill River.

Page 3, line 5––delete: 654,000 cfs on June 2, 1889.
––substitute: 740,000 cfs on March 19, 1936.

Page 4, Schuylkill River at Philadelphia––delete 150,000 and 79.
––substitute 96,200 and 51.

Page 4, Allegheny River at Warren––delete $^{e}67{,}500$.
––substitute $^{e}6{,}750$.

Alderson was 20,700 cfs on the 6th, highest for any July day in the 77 years of record (see also the accompanying monthly hydrograph); however, by the end of



Monthly mean discharge of Greenbrier River at Alderson, W.Va. (Drainage area, 1,375 square miles.)

the month the flow had decreased down to the below-normal range. Sixty-four percent of the monthly runoff at the Alderson gaging station occurred during the 4-day period July 5–8.

Flow of Silver Springs in north-central Florida increased 20 cfs, to 770 cfs, nearly normal. In the southeastern part of the State, flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, decreased to 138 cfs, 75 percent of normal. Flow of Miami Canal at Miami increased 179 cfs, to 482 cfs, 122 percent of normal.

Ground-water levels generally declined. However, levels rose in mountain and Piedmont areas of North Carolina; in the northern quarter of West Virginia; and in Florida at Tallahassee and near Orlando. Monthend levels were again above average in North Carolina and were above average also in much of Kentucky and West Virginia. Monthend levels were near average in the Piedmont of Georgia and in northern and central Florida.

WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

SEVERE FLOODING OCCURRED ALONG SEVERAL RIVERS IN EAST-CENTRAL MINNESOTA BETWEEN JULY 22 AND 29. IN INDIANA, LOCALLY SEVERE FLOODING OCCURRED ON SOME EXTREMELY SMALL DRAINAGE AREAS. ELSEWHERE IN THE REGION, FLOWS OF MOST STREAMS DECREASED AND WERE IN THE NORMAL RANGE. HOWEVER, STREAMFLOW REMAINED IN THE ABOVE-NORMAL RANGE IN MUCH OF SOUTHERN ONTARIO AND EASTERN OHIO.

In central Minnesota north of the Twin Cities area, runoff from the storm of July 21–23 caused extensive flooding in Long Prairie, Rum, (Knife-) Snake, and Kettle River basins. Rainfall totals of more than 10 inches were reported. The storm covered about a 50-mile wide area in a northeast direction from Alexandria to Duluth. The dam on Knife River (tributary to Snake River 2 miles upstream from Mora) at the outlet of Knife Lake, broke on the 24th, draining much of Knife Lake and thus compounding the flood problems in Mora. About 5,000 cfs flowed through the breached dam at the peak, contributing materially to the peak discharge of 18,600 cfs at Mora. Mille Lacs Lake (headwaters of the Rum River), with a surface area of about 132,500 acres, rose almost a foot in 48 hours, reaching a mean daily stage of 1,253.22 feet above mean sea level on July 24, 0.1 foot higher than the previous maximum in 42 years of record; seiches of about a foot in magnitude caused wide fluctuations in instantaneous readings. Peak discharge of Snake River near Pine City was estimated to be 1.1 times that which is likely to occur on the average of only once in 50 years; the discharge exceeded all those during the periods of record 1913–17, 1950, 1951–72. The peak discharge on Kettle River below Sandstone was the highest recorded since at least 1950.

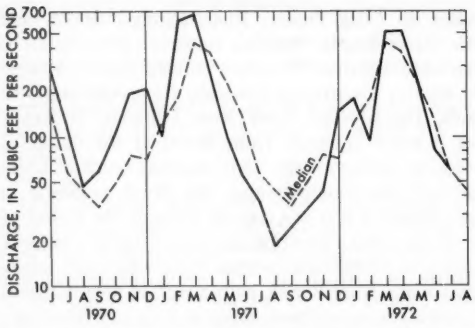
Peak discharges at several sites are listed below:

Station	*Drainage area (square miles)*	*Maximum during present flood*		
		Date	*Stage (feet)*	*Discharge (cfs)*
Rum River near St. Francis, Minn. (5-2860).	1,360	July 29	11.20	9,540
Kettle River below Sandstone, Minn. (5-3367).	----------	23	15.38	17,500
Snake River at Mora, Minn. (5-3375).	422	24	-------	18,600
Snake River near Pine City, Minn. (5-3385).	958	27	10.39	14,500
St. Croix River at St. Croix Falls, Wis. (5-3405).	5,930	25	-------	43,400

The flooding in central Minnesota caused extensive damage to roads, railways, homes, businesses, and agricultural land; early estimates reportedly exceeded 17 million dollars.

In most other parts of the Western Great Lakes region, streamflow generally decreased and was in the normal range (see graph of Red Cedar River at East Lansing in southern Michigan).

Ground-water levels in shallow wells declined in the region except in the areas of heavy rains in central Minnesota. Monthend levels were above average in Minnesota and Michigan's Upper Peninsula; and near average in Indiana, Ohio, and Michigan's Lower Peninsula. In the Minneapolis-St. Paul area of Minnesota,



Monthly mean discharge of Red Cedar River at East Lansing, Mich. (Drainage area, 355 square miles.)

levels in wells tapping artesian aquifers continued to decline and were below average.

MIDCONTINENT

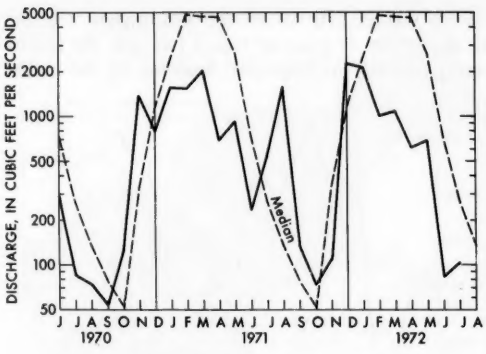
[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

BELOW-NORMAL FLOWS OF STREAMS IN PARTS OF ARKANSAS, KANSAS, LOUISIANA, AND OKLAHOMA CONTRASTED WITH FLOOD FLOWS IN AND NEAR IOWA CITY, IOWA, AND FLASH FLOODS IN EASTERN NEBRASKA.

In eastern Iowa, rainfall of about 5 inches caused record-high or near-record stages and discharges in the Rapid and Ralston Creek basins near Iowa City. Damages in Iowa City from the Ralston Creek flood reportedly exceeded $250,000. Peak discharge of Ralston Creek at Iowa City (drainage area, 3.01 square miles), was 1,800 cfs (stage 9.03 feet) on July 17—likely to occur on the average of only once in 35 years; the highest discharge in the 48 years of record was 1,940 cfs on September 21, 1965. Peak discharge of Rapid Creek near Iowa City (drainage area, 25.3 square miles), was 5,500 cfs (stage, 14.93 feet) on the 17th—equal to a once-in-65-year flood; the highest discharge in 35 years of record was 6,100 cfs on May 23, 1965.

In eastern Nebraska, heavy thunderstorms during the month caused local flash flooding and considerable lowland flooding in many drainage basins. Local minor flooding in small areas occurred in scattered areas of Kansas and Oklahoma.

Low-streamflow conditions characterized northwestern Kansas, southeastern Louisiana, and parts of a 4-State area centered on Arkansas. For example, monthly mean discharge of Saline River near Rye in southeastern Arkansas, was 102 cfs, 38 percent of median for July (see graph). In southeastern Oklahoma, monthly mean discharge of Washita River near Durwood (drainage area, 7,202 square miles), was 131 cfs, only 19



Monthly mean discharge of Saline River near Rye, Ark. (Drainage area, 2,062 square miles.)

percent of median. In southeastern Louisiana, monthly mean discharge of Amite River near Denham Springs (drainage area, 1,280 square miles), was 498 cfs, 48 percent of median, and lowest discharge for the month in the 34 years of record. In northwestern Kansas, monthly mean discharge of Saline River near Russell (drainage area, 1,502 square miles), was 15.4 cfs, 14 percent of the monthly median.

In south-central Texas, flow of Comal Springs at New Braunfels was 308 cfs near end of month.

In Manitoba, the level of Lake Winnipeg at Gimli, averaged 715.97 feet above mean sea level, 1.92 feet above the long-term mean for July.

Ground-water levels in water-table wells unaffected by pumping declined seasonally except in areas subject to recharge from unusually heavy rains such as occurred in the Iowa City, Iowa, area. Monthend levels were near or above average in Iowa and North Dakota. In Arkansas, the water level declined slightly in the shallow aquifer (Quaternary deposits) in the rice-irrigation area in the east-central part of the State, and rose and was above average at El Dorado in the industrial aquifer (Sparta Sand) in the central and southern parts. In southwestern Louisiana, levels rose in the Chicot aquifer, reflecting a decrease in pumpage for rice irrigation. In Texas, levels rose in the Edwards Limestone at Austin, but declined in the Edwards at San Antonio as well as in the Evangeline aquifer at Houston and in the bolson deposits at El Paso. Monthend levels were above average at Austin and San Antonio and below average at Houston and El Paso.

WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW DECREASED SEASONALLY THROUGHOUT THE REGION EXCEPT IN ARIZONA AND NEW MEXICO. STREAMFLOWS INCREASED IN MANY PARTS OF THOSE TWO STATES. FLOWS IN

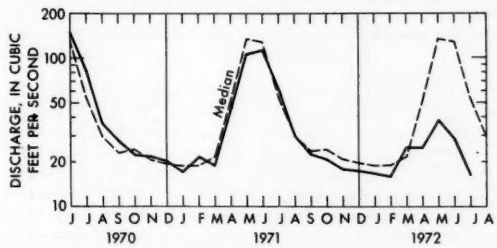
THE ABOVE-NORMAL RANGE CHARACTERIZED MUCH OF THE NORTHERN PART OF THE REGION, AND BELOW-NORMAL FLOWS CONTINUED IN SOME SOUTHERN AREAS FOR THE SIXTH CONSECUTIVE MONTH. SOME MUNICIPAL WATER SHORTAGES WERE REPORTED IN THE SAN FRANCISCO BAY AREA.

In central and southern California, streamflow decreased seasonally and remained in the below-normal range where it has been almost continuously since February. In the San Joaquin River basin, daily mean discharge of Kings River above North Fork, near Timmers (drainage area, 952 square miles), was 190 cfs on July 31, the lowest daily mean for July in 42 years of record. Municipal water shortages, attributed to record-high temperatures greater than 100°F., were reported during the month in the San Francisco Bay area.

In central and southern Arizona, streamflow increased seasonally on San Pedro River at Charleston and decreased on Salt River near Roosevelt, but was below the normal range for July in both basins. Elsewhere in the State, streamflow was in the normal range.

In northern New Mexico, streamflow remained below the normal range on Rayado Creek at Sauble Ranch near Cimarron and Rio Grande at Otowi Bridge near San Ildefonso for the fourth consecutive month, but rains in the upper Pecos River basin increased the monthly mean flow at Santa Rosa into the above-normal range (287 percent of median). Flash flooding July 17 in Gallup, in northwestern New Mexico, caused damages reported to total about 2 million dollars.

In southern Utah, and the adjacent area of southwestern Colorado, streamflow decreased and was in the below-normal range. Monthly mean discharge of Beaver River near Beaver, in southwestern Utah, was 16.3 cfs, lowest for July in 58 years of record (see graph). Flow at



Monthly mean discharge of Beaver River near Beaver, Utah (Drainage area, 82 square miles.)

this station has been below the normal range in 5 of the past 6 months and cumulative runoff for the water year to July 31 was only 40.6 percent of median. In northern Utah, level of Great Salt Lake declined 0.50 foot during the month (to 4,198.75 feet above mean sea level), 1.00 foot higher than a year ago, and 7.40 feet above the lowest level in 68 years of record, which occurred in October 1963.

In Idaho, streamflow decreased but was above the normal range except in the southwest. Monthly mean discharge of Salmon River at Whitebird, in central Idaho, has been in the above-normal range during 21 of the past 26 months, and that of Snake River near Heise, in the southeast, has been above the normal range for 19 of the past 21 months. Above-normal discharge occurred also during July in Spokane and Clearwater River basins in the north and in Boise River basin in the south. Heavy withdrawals for irrigation reduced flow of Snake River at Weiser, in southwestern Idaho, to near the median for the month.

Above-normal streamflow continued in the provinces of Alberta and British Columbia, and in parts of Washington, Montana, and Wyoming, as the result of either high carryover flows from June, from continued high-altitude snowmelt, or from rain, or combinations of those factors. In northwestern Washington, daily mean discharge of Skykomish River near Gold Bar (drainage area, 535 square miles), was 20,600 cfs on the 13th, highest for a July day in the 44 years of record.

Reservoir storage generally decreased seasonally in the region but remained near or above average in most major reservoirs. Net decline in storage in the Colorado River Storage Project was 361,800 acre-feet. Storage remained far below normal in New Mexico reservoirs.

Ground-water levels declined in most of the region, including Montana, Washington, Nevada, southern California, and southern New Mexico. Monthend levels were above average in Montana and Washington; near average in southern California; and below average in southern New Mexico and most of southern Arizona. In southern Idaho, monthend levels were below average in the Rupert-Minidoka area and above average near Atomic City and in the Boise Valley.

ALASKA

Streamflow increased in the south and southeast, and decreased in the central and south-central areas of the State. Monthly mean flow of Little Susitna River near Palmer, in the south-central area, decreased seasonally, but ablation of the heavy, upper-elevation snowpack in the Talkeetna Mountains north of Palmer, caused the monthly mean flow at Palmer to be in the above-normal range and increased the cumulative runoff for the first 10 months of the water year (October through July) at that site to 124 percent of median as compared to 73 percent at the end of the first 8 months. Elsewhere in the State streamflow was in the normal range.

Ground-water levels in the Anchorage area rose 2 to 4 feet in the deep artesian aquifers; there was little or no change in levels in water-table wells. Ground-water levels continued to rise on the western Kenai Peninsula.

Provisional data; subject to revision

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JULY 1972

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of June 1972	End of July 1972	End of July 1971	Average for end of July	Normal maximum
	Percent of normal maximum				
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	91	75	68	58	223,400 (a)
QUEBEC					
Gouin (P)	49	52	68	71	6,487,000 ac-ft
Allard (P)	89	95	74	74	280,600 ac-ft
MAINE					
Seven reservoir systems (MP)	98	97	72	77	179,300 mcf
NEW HAMPSHIRE					
Lake Winnipesaukee (PR)	104	102	90	86	7,200 mcf
Lake Francis (FPR)	96	96	89	87	4,326 mcf
First Connecticut Lake (P)	93	96	92	89	3,330 mcf
VERMONT					
Somerset (P)	95	89	85	82	2,500 mcf
Harriman (P)	83	81	76	78	5,060 mcf
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	94	88	81	83	3,394 mcf
NEW YORK					
Great Sacandaga Lake (FPR)	105	79	84	82	34,270 mcf
Indian Lake (FMP)	111	103	86	89	4,500 mcf
New York City reservoir system (MW)	100	98	79	-:----	547,500 mg
NEW JERSEY					
Wanaque (M)	101	96	80	80	27,730 mg
PENNSYLVANIA					
Wallenpaupack (P)	91	79	85	73	6,875 mcf
Pymatuning (FMR)	111	101	90	92	8,191 mcf
MARYLAND					
Baltimore municipal system (M)	102	100	99	88	85,340 mg
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	99	95	77	89	12,580 mcf
High Rock Lake (P)	100	79	80	75	10,230 mcf
Narrows (Badin Lake) (P)	99	92	98	100	5,616 mcf
SOUTH CAROLINA					
Lake Murray (P)	98	92	92	74	70,300 mcf
Lakes Marion and Moultrie (P)	90	90	90	67	81,100 mcf
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	77	75	74	68	75,360 mcf
GEORGIA					
Burton (PR)	100	90	98	90	104,000 ac-ft
Lake Sidney Lanier (FMPR)	65	62	65	61	1,686,000 ac-ft
Sinclair (MPR)	95	81	90	91	214,000 ac-ft
ALABAMA					
Lake Martin (P)	96	95	95	89	1,373,000 ac-ft
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	69	62	73	53	1,166,000 cfsd
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	86	80	71	60	1,452,000 cfsd
Douglas Lake (FPR)	83	71	65	58	715,800 cfsd
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	85	80	88	73	523,700 cfsd
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	94	87	87	76	751,400 cfsd
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	94	94	89	84	15,900 mcf
Wisconsin River (21 reservoirs) (PR)	71	68	81	74	17,400 mcf
MINNESOTA					
Mississippi River headwater system (FMR)	36	38	36	39	1,640,000 ac-ft

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	End of June 1972	End of July 1972	End of July 1971	Average for end of July	Normal maximum
	Percent of normal maximum				
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	99	98	98	--------	22,640,000 ac-ft
NEBRASKA					
Lake McConaughy (IP)	90	82	95	73	1,948,000 ac-ft
OKLAHOMA					
Keystone (FPR)	80	85	91	96	661,000 ac-ft
Lake O' The Cherokees (FPR)	96	95	97	90	1,492,000 ac-ft
Tenkiller Ferry (FPR)	91	99	87	93	628,200 ac-ft
Lake Altus (FIMR)	23	28	17	60	134,500 ac-ft
Eufaula (FPR)	78	76	87	82	2,378,000 ac-ft
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	86	83	78	97	2,722,000 ac-ft
TEXAS					
Possum Kingdom (IMPRW)	96	96	68	83	724,500 ac-ft
Buchanan (IMPW)	92	87	61	80	955,200 ac-ft
Bridgeport (IMW)	78	70	56	66	270,900 ac-ft
Eagle Mountain (IMW)	92	91	88	89	182,700 ac-ft
Medina Lake (I)	100	98	39	49	254,000 ac-ft
Lake Travis (FIMPRW)	94	91	64	75	1,144,000 ac-ft
Lake Kemp (IMW)	43	40	16	55	461,800 ac-ft
THE WEST					
ALBERTA					
Spray (P)	86	89	92	79	210,000 ac-ft
Lake Minnewanka (P)	93	93	92	78	199,700 ac-ft
St. Mary (I)	81	91	93	88	320,800 ac-ft
WASHINGTON					
Franklin D. Roosevelt Lake (IP)	93	100	94	94	5,232,000 ac-ft
Lake Chelan (PR)	90	100	99	99	676,100 ac-ft
IDAHO--WYOMING					
Upper Snake River (7 reservoirs) (IMP)	97	88	97	74	4,282,000 ac-ft
WYOMING					
Pathfinder, Seminoe, Alcova, Kortes, and Glendo Reservoirs (I)	82	74	81	43	3,016,000 ac-ft
Buffalo Bill (IP)	96	100	103	102	421,300 ac-ft
Boysen (FIP)	101	98	100	89	802,000 ac-ft
Keyhole (F)	91	91	84	37	199,900 ac-ft
COLORADO					
John Martin (FIR)	0	0	0	23	364,400 ac-ft
Colorado–Big Thompson project (I)	95	87	90	70	722,600 ac-ft
Taylor Park (IR)	102	101	96	92	106,000 ac-ft
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (IFPR)	61	60	57	--------	31,276,500 ac-ft
UTAH--IDAHO					
Bear Lake (IPR)	98	96	96	64	1,421,000 ac-ft
CALIFORNIA					
Hetch Hetchy (MP)	90	83	96	77	360,400 ac-ft
Lake Almanor (P)	84	82	100	56	1,036,000 ac-ft
Shasta Lake (FIPR)	91	83	93	80	4,377,000 ac-ft
Millerton Lake (FI)	61	38	62	66	503,200 ac-ft
Pine Flat (FI)	51	28	54	54	1,014,000 ac-ft
Isabella (FIR)	21	15	34	38	551,800 ac-ft
Folsom (FIP)	97	86	87	80	1,000,000 ac-ft
Lake Berryessa (FIMW)	80	77	92	83	1,600,000 ac-ft
Clair Engle Lake (Lewiston) (P)	99	92	94	83	2,438,000 ac-ft
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	89	87	97	71	744,600 ac-ft
NEVADA					
Rye Patch (I)	98	93	103	53	179,100 ac-ft
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	67	66	65	72	27,970,000 ac-ft
ARIZONA					
San Carlos (IP)	5	2	0	12	948,600 ac-ft
Salt and Verde River system (IMPR)	38	33	34	38	2,073,000 ac-ft
NEW MEXICO					
Conchas (FIR)	32	46	45	--------	352,600 ac-ft
Elephant Butte and Caballo (FIPR)	7	5	5	--------	2,539,000 ac-ft

[a] Thousands of kilowatt-hours.

Provisional data; subject to revision

FLOW OF MAJOR RIVERS DURING JULY 1972

River and location	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	July 1972					
			Monthly mean discharge (cfs)	Percent of median monthly discharge[1]	Change in discharge from previous month (percent)	Discharge near end of month		
						(cfs)	(mgd)	Date
St. Lawrence River at Lake St. Lawrence[2]	295,200	239,100	310,000	124	+4	310,000	200,000	28
Delaware River at Trenton, N.J	6,780	11,360	15,353	286	-54	5,160	3,340	31
Susquehanna River at Harrisburg, Pa	24,100	33,670	53,450	460	-68	16,800	10,900	31
Potomac River near Washington, D.C	11,560	10,650	17,300	393	-63	9,000	5,800	31
Altamaha River at Doctortown, Ga	13,600	13,380	7,581	114	+10	5,580	3,600	25
Tombigbee River near Coatopa, Ala[3]	15,400	22,160	4,795	70	+35	3,500	2,260	31
Missouri River at Hermann, Mo	528,200	77,480	63,190	80	-10	68,400	44,200	24
Ohio River at Louisville, Ky[4]	91,170	110,600	107,600	193	+14	32,600	21,100	30
Mississippi River near Vicksburg, Miss[5]	1,144,500	552,700	475,200	94	+18	412,000	266,000	31
Colorado River near Grand Canyon, Ariz	137,800	.....	14,170	.....	-2	.....	.....	.....
Columbia River at The Dalles, Oreg[6]	237,000	194,000	348,000	129	-55	.....	.....	.....
Fraser River at Hope, British Columbia	78,300	95,300	261,000	157	-32	212,000	137,000	28

[1]Reference period 1931–60 or 1941–70.

[2]Records furnished by Department of the Army, Corps of Engineers, Buffalo District. Discharges shown are considered to be the same as those at Ogdensburg, N.Y., which is directly opposite Prescott, Ontario.

3At Demopolis lock and dam.

[4]Records furnished by U.S. Army, Corps of Engineers.

[5]Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.

[6]Discharge (adjusted for upstream storage) determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

WATER RESOURCES REVIEW — JULY 1972

Cover map shows generalized pattern of streamflow for July based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for July 1972 is compared with flow for July in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below normal* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for July is considered to be *above normal* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range*. In the Water Resources Review *normal flow* is defined as the median of the 30 flows of July during the reference period. The normal (median) has been obtained by ranking those 30 flows in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the normal (median).

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the July flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of July. Water level in each key observation well is compared with average level for the end of July determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels* unless described otherwise, are from the end of June to the end of July.

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This issue was prepared by J.C. Kammerer, H.D. Brice, E.W. Coffay. and L.C. Fleshmon from reports of the field offices, August 4, 1972.

ESTIMATED USE OF WATER IN THE UNITED STATES IN 1970

The accompanying abstract and tables are from the report, *Estimated use of water in the United States in 1970*, by C. Richard Murray and E. Bodette Reeves: U. S. Geological Survey Circular 676, 37 pages, 1972. Circular 676 may be obtained free on request to U. S. Geological Survey, Branch of Distribution, 1200 S. Eads Street, Arlington, Va. 22202.

ABSTRACT

Estimates of water use in the United States in 1970 indicate that an average of about 370 bgd (billion gallons per day)--about 1,800 gallons per capita per day--was withdrawn for the four principal off-channel uses which are (1) public-supply (for domestic, commercial, and industrial uses), (2) rural (domestic and livestock), (3) irrigation, and (4) self-supplied industrial (including thermoelectric power). In 1970, withdrawals for these uses exceeded by 19 percent the 310 bgd estimated for 1965 (table 1). Increases in the various categories of off-channel water use since 1965 were: approximately 25 percent for self-supplied industry (mainly in electric-utility thermoelectric plants), 13 percent for public supplies, 13 percent for rural supplies, and 8 percent for irrigation. Industrial water withdrawals included 54 bgd of saline water, a 20 percent increase in 5 years. The fifth principal withdrawal use, hydroelectric power (an in-channel use), amounted to 2,800 bgd, a 5-year increase of 22 percent. In computing total withdrawals, recycling within a plant (reuse) is not counted, but withdrawal of the same water by a downstream user (cumulative withdrawals) is counted. The quantity of fresh water consumed--that is, water made unavailable for further possible withdrawal because of evaporation, incorporation in crops and manufactured products, and other causes--was estimated to average 87 bgd for 1970, an increase of about 12 percent since 1965.

Estimates of water withdrawn from the principal sources indicated that 68 bgd came from fresh ground water, 1 bgd came from saline ground water, 250 bgd came from fresh surface water, 53 bgd came from saline surface water, and 0.5 bgd was reclaimed sewage.

The average annual streamflow--simplified measure of the total available water supply--is approximately 1,200 bgd in the conterminous United States. Total water withdrawn in 1970 for off-channel uses (withdrawals other than for hydroelectric power) amounted to about 30 percent of the average annual streamflow; 7 percent of the 1,200 bgd basic supply was consumed. However, comparisons of Water Resources Council regions indicate that the rate of withdrawal was higher than the locally dependable supply in the Middle Atlantic, Texas-Gulf, Rio Grande, Lower Colorado, and California-South Pacific regions. Consumption amounted to nearly 25 percent of withdrawals in the conterminous United States; however, fresh-water consumption amounted to only 14 percent of off-channel withdrawals in the 31 Eastern States and ranged from 30 percent to nearly 70 percent of off-channel withdrawals in the Water Resources Council regions in the West. In the Rio Grande and Lower Colorado regions, fresh-water consumption in 1970 exceeded the estimated dependable supply of fresh water.

Table 2.—*Comparative per capita water withdrawals and water consumptions, (eastern and western Water Resources Council Regions and total United States), in gallons per day, 1970*

[All per capita data in this table have been rounded to two significant figures]

	Public supplies only			All withdrawal uses			
	Population served (millions)	All uses	Domestic and public uses only[1]	Total population 1970 (millions)	Excluding water-power	Including water-power	Fresh water consumed, all off-channel uses
9 eastern WRC regions.	114.4	160	100	145.5	1,400	10,000	81
9 western WRC regions.	47.4	180	130	56.6	2,900	30,000	1,300
50 States and District of Columbia.	162.6	170	110	203.2	1,800	16,000	430

[1] Includes water losses in systems.

Table 3.—*Changes in water withdrawals and consumption in the United States, in billion gallons per day, 1950–70*

	1950	1955	1960	1965	1970	Percent increase or decrease, 1965–70
Total population (millions)	150.7	164	179.3	193.8	203.2	5
Public supplies	14	17	21	24	27	13
Rural domestic and livestock	3.6	3.6	3.6	4.0	4.5	13
Irrigation	[1]110	110	110	120	130	8
Thermoelectric power (electric utility) use	[2]40	72	100	130	170	33
Other self-supplied industrial use	[2]37	39	38	46	47	2
Total withdrawals	200	240	270	310	370	19
Fresh ground water	34	47	50	60	68	13
Saline ground water	----------	.65	.38	.47	1.0	113
Fresh surface water	[3]160	180	190	210	250	19
Saline surface water	[3]10	18	31	43	53	23
Reclaimed sewage	----------	.2	.1	.7	.5	-29
Water consumed by off-channel uses	----------	----------	61	77	87	13
Water used for hydroelectric power	1,100	1,500	2,000	2,300	2,800	22

[1] Including an estimated 30 bgd in irrigation conveyance losses.

[2] Estimated distribution of 77 bgd reported by MacKichan (1951).

[3] Distribution of 170 bgd of fresh and saline water reported by MacKichan (1951).

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